

8.16 HOWARD COUNTY

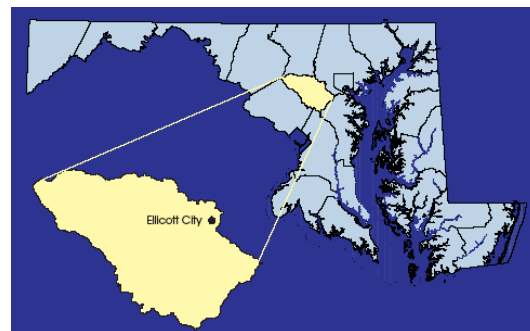
This chapter presents information about stream conditions of potential management interest in Howard County based on the 2000-2004 Maryland Biological Stream Survey (MBSS) results. Information from MBSS data collected between 1994 and 1997 can be found in MDNR 2001n.

8.16.1 Ecological Health

Based on the three ecological health indicators used by the MBSS, the overall condition of Howard County streams during 2000-2004 was Fair (Figure 8-123). The FIBI results indicate that 39% of the streams in the county were in Good condition, while 27% rated Good using the BIBI. In contrast, 24% of the streams in the county scored as Poor or Very Poor using the Combined Biotic Index (CBI), while 15% scored as Good and 61% scored as Fair.

No strong geographic trends were evident in IBI scores. However, sites which rated Good for both fish and benthos were all located in the western half of the county. The highest rated stream in Howard County using the CBI was an unnamed tributary to the Patuxent River near Rocky Gorge (Table 8-31). In contrast, the lowest rated streams included unnamed tributaries to the Middle Patuxent River, Deep Run, and Plumtree Branch. Based on Stream Waders volunteer data, a number of sites were rated Good for benthic macroinvertebrates in the Brighton Dam watershed, while there were a large number of sites in the Little Patuxent River watershed rated as Very Poor (Table 8-32).

One MBSS Sentinel site was located in Howard County, an unnamed tributary to the Patuxent River in the Rocky Gorge watershed. Sentinel sites were chosen to provide a representation of the best remaining streams around the state and track natural variations in stream health. Where possible, Sentinel sites are located in watersheds with as much protected land as possible, or in areas projected to



become degraded from development at a slower pace. More information about the MBSS Sentinel stream network is found in: 2000-2004 Maryland Biological Stream Survey Volume 11: Sentinel Sites (http://www/dnr/Maryland.gov/streams/pubs/ea05-8_sentinel.pdf).

8.16.2 Physical Habitat

8.16.2.1 Overall Condition

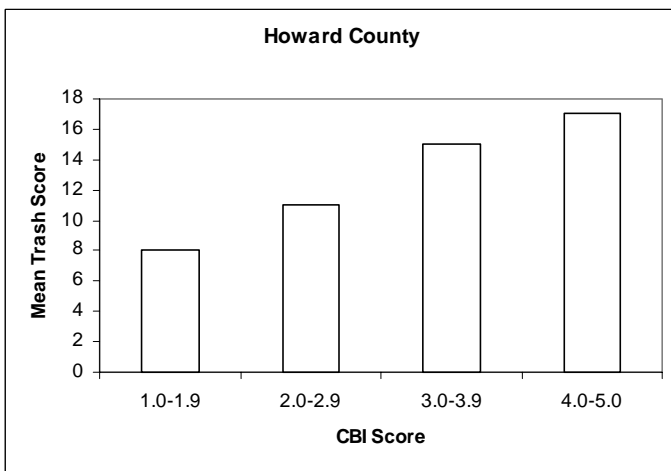
Based on the Physical Habitat Index (PHI), 25% of the streams in Howard County had Minimally Degraded habitat, 45% had Partially Degraded habitat, and 27% had Degraded or Severely Degraded habitat (Figure 8-124). Sites with Minimally Degraded habitat were mostly located in the eastern portion of the county; and most of the Degraded and Severely Degraded sites were located there as well. In the western portion of the county, nearly all sites were rated as Partially Degraded.

8.16.2.2 Trash

Nearly 47% of the stream miles in Howard County were rated Optimal for trash (Figure 8-125). In contrast, 17% of streams were rated as being in Marginal or Poor condition. Sites with high levels of riparian and instream trash were all located in the eastern portion of the county, and few sites in that area received an Optimal rating. In

TRASH VS CBI

Trash, or human refuse, is common along roadways and streams in Maryland's urban and urbanizing areas. In Howard County, there was a moderately strong negative relationship between the amount of trash at a site and its Combined Biotic Index score. Potential reasons for this relationship include illegal dumping and runoff of pollutants from associated impervious areas.



Howard County Trash vs. CBI score bar graph

general, sites along publicly owned lands on the Patuxent and South Branch Patapsco Rivers had very low levels of trash.

8.16.2.3 Channelization

About 17% of the stream miles in Howard County were channelized (Table 8-4). Rip-rap (9%) and culvert pipes (8%) were the most common types of channelization (Figure 8-126). Other types documented included earthen ditches and concrete. No strong geographic trends were evident.

8.16.2.4 Inadequate Riparian Buffer

Nearly 5% of the stream miles in Howard County had no riparian buffers during the 2000-2004 MBSS (Table 8-3). In addition, 7% of stream miles had severe breaks in existing riparian buffers. There was no apparent geographic trend evident in the few sites in the county that had inadequate riparian buffers (Figure 8-127). There was also no geographic trend evident for sites that had severe breaks in the riparian buffer zone. Additional information about buffer breaks, analyzed by county, is provided in: 2000-2004 Maryland Biological Stream Survey Volume 10: Riparian Zone Conditions (http://www/dnr/Maryland.gov/streams/pubs/ea05-7_riparian.pdf).

8.16.2.5 Eroded Banks/Bedload Movement

About 44% of the stream miles in Howard County were rated as having Poor or Marginal bank erosion (Figure 8-128). In contrast, 20% of streams had minimal (Optimal) bank erosion. Bank erosion problems were scattered throughout the county, but the South Branch Patapsco River watershed appeared to have fewer bank erosion problems than in the rest of the county.

Most streams in Howard County were rated as having minor or moderate bar formation (Figure 8-128). At the extremes, 23% of streams were devoid of bars, while 10% of streams had extensive bank erosion. Sites with extensive bar formation were distributed mostly in the central portion of the county, while the few sites with minimal bars were clustered in the upper Patuxent area.

8.16.3 Key Nutrients

8.16.3.1 Nitrate-Nitrogen

Only 8% of the stream miles in Howard County had nitrate-nitrogen levels similar to values found in forested streams in Maryland (Figure 8-129). Of the 94% of streams with elevated nitrate-nitrogen levels, only 3% had values higher than 5 mg/l, the threshold for biological impacts as evident in MBSS data. The highest levels of nitrate-nitrogen were found in the western portion of the county. The lowest levels occurred along the border with Anne Arundel County.

8.16.3.2 Total Phosphorus

Most of the stream miles in Howard County had total phosphorus levels within the range of values for forested streams in Maryland (Figure 8-130). Of the 21% of streams with elevated levels, 5% had values above the threshold where biological effects are more likely to occur. With the exception of a single site located east of Rocky Gorge Dam, elevated levels of total phosphorus were found in the west-central part of Howard County.

8.16.4 Stream and River Biodiversity

To provide a means to prioritize stream systems for biodiversity protection and restoration within each county and on a statewide basis, a tiered watershed and stream reach prioritization method was developed. Special emphasis was placed on state-listed species, stronghold watersheds for state-listed species, and stream reaches with one or more state-listed aquatic fauna. Fauna

AN IMPORTANT NOTE ON BIODIVERSITY MANAGEMENT

Perhaps the largest ongoing natural resources restoration and protection effort in Maryland is associated with the Chesapeake Bay. In most cases, freshwater biodiversity is not specifically considered during placement and prioritization of Bay restoration and protection projects. In this report and in the more detailed volume in the series on aquatic biodiversity, a system of biodiversity ranking is presented to provide counties and other stewards with a means to plan appropriate protection and restoration activities in locations where they would most benefit stream and river species. Given the historically low level of funding for biodiversity protection and restoration in Maryland and elsewhere, the potential benefit of incorporating freshwater biodiversity needs into other efforts is quite large.

However, it is important to note that although freshwater taxa are the most imperiled group of organisms in Maryland, other groups and individual species not typically found in freshwater habitats are also at high risk and constitute high priority targets for conservation. In addition, freshwater taxa that prefer habitats such as small wetlands may not be well-characterized by the ranking system employed here. To conserve the full array of Maryland's flora and fauna, it is clearly necessary to use other, landscape-based tools and consider factors such as maintaining or reconnecting terrestrial travel corridors.

considered included stream salamanders, freshwater fishes, and freshwater mussels. Rare, pollution-sensitive benthic macroinvertebrates collected during the 1994-2004 MBSS were also used to identify the suite of watersheds necessary to conserve the full array of known stream and river biota in Maryland. A complete description of the biodiversity ranking process is found in: 2000-2004 Maryland Biological Stream Survey Volume 9: Stream and Riverine Biodiversity (http://www/dnr/Maryland.gov/streams/pubs/ea05-6_biodiv.pdf).

Of the seven watersheds found in Howard County, Rocky Gorge Dam and Little Patuxent River were classified as Tier 1, meaning that these watersheds serve as strongholds for one or more state listed aquatic species (Figure 8-131). The Patuxent River Upper, South Branch Patapsco, and Middle Patuxent River watersheds were classified as Tier 2 watersheds, meaning that they serve as strongholds for one or more non-state listed species of Greatest Conservation Need (GCN), and have state-listed aquatic fauna present. In contrast, the Brighton Dam

watershed was among the lower ranking for stream and river biodiversity in the state (72nd of 84). Any reaches that had either state-listed or GCN species, or high intactness values were highlighted to facilitate additional emphasis in planning restoration and protection activities.

8.16.5 Stressors

At 100% of stream miles, the most extensive stressor characterized by the MBSS in Howard County during the 2000-2004 MBSS was non-native terrestrial plants in the riparian zone (Figure 8-5). Other stressors found extensively were: streams with non-native aquatic fauna (77% of stream miles); eroded banks (55% of stream miles); streams with upstream land use > 5% urban (33% of stream miles); and streams with no riparian buffer (5%). Several other stressors affected 5% or less of the stream miles in the county. These included areas with acid deposition, channelized streams, and high nitrate-nitrogen levels.

The Howard County Stormwater Management Division began a multi-year, rotating basin sampling across the county in 2001. The primary goals of the Howard County biomonitoring program are to assess the ecological status of County streams and watersheds and to establish a baseline for comparing future assessments. Results will also be related to programmatic activities, such as BMP siting, installation, and evaluation; stormwater discharge permits; contributing to restoration initiatives; and guidelines for Low Impact Development.

The County's overall sampling design was developed to be directly comparable to the MBSS and to allow for the sharing of data among agencies. Ten sites in each of 15 subwatersheds were sampled over three years. Final selection and placement of sampling segments was random and stratified by subwatershed and stream order.

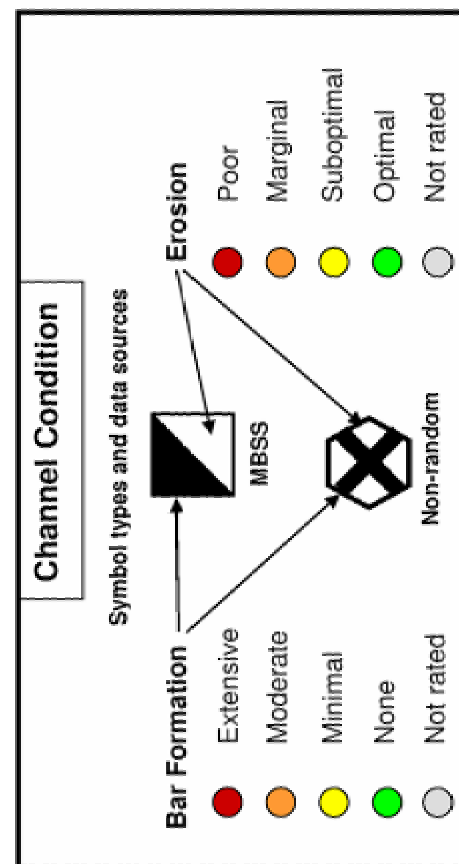
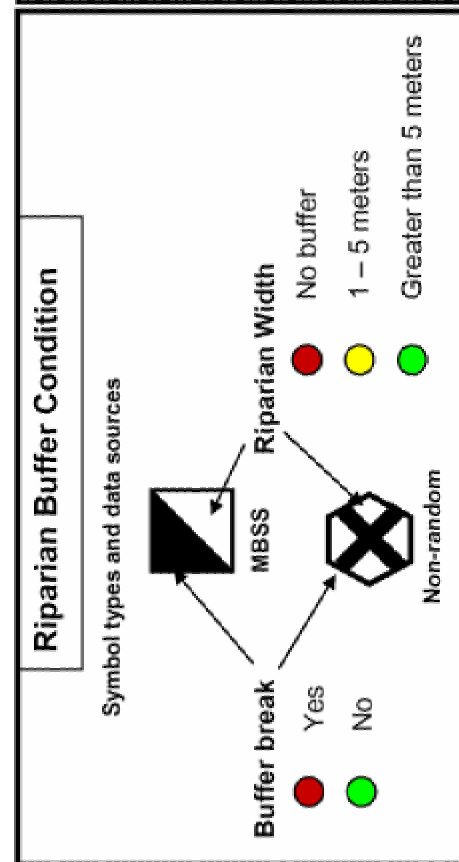
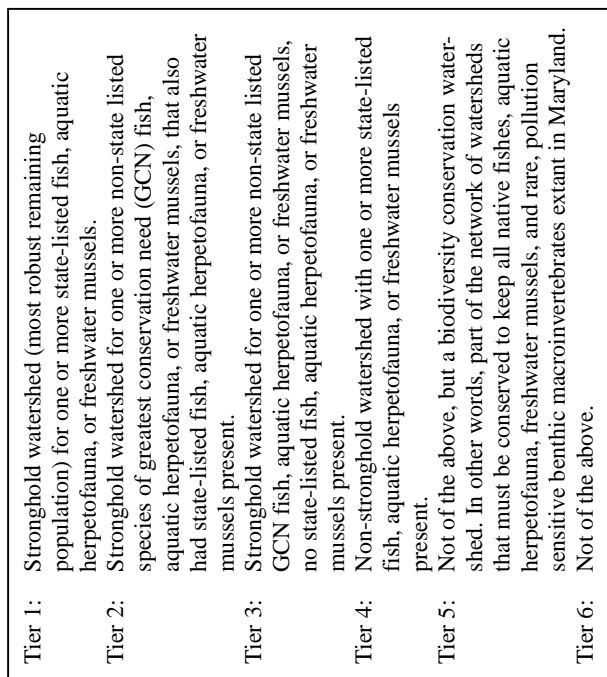
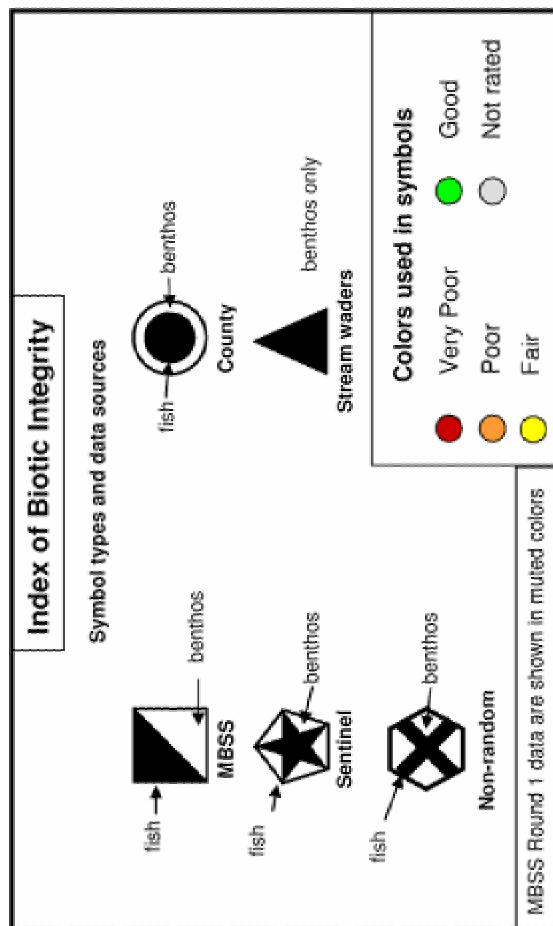
All field sampling was completed during the spring index period. Sampling included benthic macroinvertebrate and physical habitat assessments in accordance with the MBSS Sampling Manual (Kazyak 2001). Field chemistry sampling, modified Wolman pebble counts, and channel cross-sections were also conducted. Laboratory processing of benthic macroinvertebrates were consistent with MBSS methods outlined in Boward and Friedman (2000) and MBSS IBIs (Southerland et al. 2005) were calculated for each site.

To date, Howard County has conducted stream sampling and produced reports for the following subwatersheds: Little Patuxent River, Cattail Creek, and Brighton Dam (Pavlik and Stribling 2001); Middle Patuxent River (Pavlik and Stribling 2003); Rocky Gorge, Dorsey Run, and Hammond Branch (Pavlik and Stribling 2004); and the Patapsco River Tributary Watersheds (Pavlik and Stribling 2005). Written reports are forthcoming for the other seven subwatersheds.

To better estimate stream condition in the County, MBSS data were integrated with Howard County data to arrive at a combined estimate of stream condition using the benthic macroinvertebrate IBI. The scores from approximately 150 County sites were combined with scores from 42 random MBSS sites. Results are shown in the following table. Note that while the overall score changed little, the standard error decreased drastically when the data from the programs were combined; thus increasing the precision of the estimate. This increased precision allows for a more accurate assessment of overall stream health in Howard County. In the future, the MBSS and the County will continue to coordinate sampling in ways that balance monitoring effort and desired precision of stream condition estimates.

Sampling Program	Mean Benthic IBI	Standard Error	Condition Class
MBSS Alone	3.11	0.15	Fair
Howard County Alone	2.91	0.06	Poor
Combined	2.94	0.003	Poor

Key to MBSS 2000-2004 County Maps



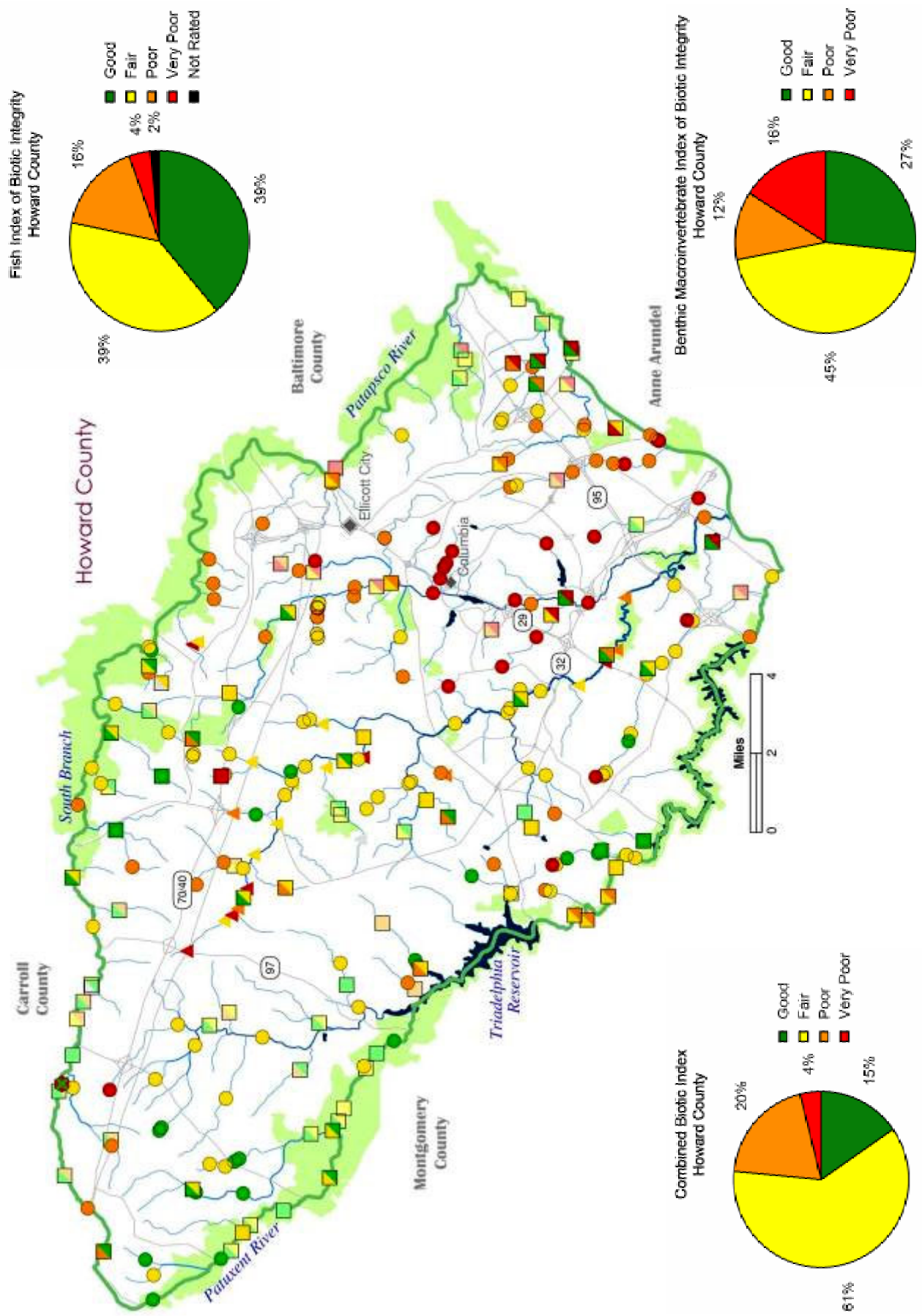


Figure 8-123. Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI) pie charts and map of stream health for Howard County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie charts represent 2000-2004 data only, Combined Biotic Index pie chart represents mean of FIBI and BIBI)

Table 8-31. MBSS sites sampled in Howard County during 1994- 2004, ranked by Combined Biotic Index Score (CBI)

Howard County - MBSS Sites			
SITE NUMBER	STREAM NAME	WATERSHED	CBI
<i>Best (in order of CBI score)</i>			
RKGR-119-S-2001	Patuxent River UT2	Rocky Gorge Dam	4.83
SBPA-207-R-2000	South Branch Patapsco River UT4	Patapsco South Branch	4.67
HO-P-239-217-97	Dorsey Run	Brighton Dam	4.50
CR-P-120-232-96	Patapsco River	Patapsco South Branch	4.50
HO-P-069-229-97	Middle Patuxent River UT	Patuxent River Upper	4.33
RKGR-119-S-2004	Patuxent River UT3	Rocky Gorge Dam	4.33
RKGR-101-R-2002	Rocky Gorge Reservoir UT2	Rocky Gorge Dam	4.33
BRIG-307-R-2000	Patuxent River Mainstem	Brighton Dam	4.33
SBPA-113-R-2000	South Branch Patapsco River UT3	Patapsco South Branch	4.33
HO-P-108-313-95	Patapsco River	Patapsco South Branch	4.17
HO-P-154-125-96	South Branch Patapsco River UT	Patapsco South Branch	4.17
RKGR-119-S-2000	Patuxent River UT4	Rocky Gorge Dam	4.17
RKGR-119-S-2002	Patuxent River UT5	Rocky Gorge Dam	4.17
MPAX-411-R-2002	Middle Patuxent River	Patuxent River Middle	4.00
RKGR-119-S-2003	Patuxent River UT6	Rocky Gorge Dam	4.00
HO-P-228-119-97	Patuxent River UT	Rocky Gorge Dam	4.00
SBPA-108-R-2000	South Branch Patapsco River UT3	Patapsco South Branch	4.00
HO-P-151-222-96	Patapsco River	Patapsco South Branch	4.00
HO-P-244-307-96	Patapsco River	Patapsco South Branch	4.00
BRIG-212-R-2000	Cabin Branch	Brighton Dam	3.83
BRIG-206-R-2000	Cabin Branch	Brighton Dam	3.83
HO-P-083-235-97	Cabin Branch	Brighton Dam	3.83
HO-P-058-125-97	Benson Branch	Middle Patuxent River	3.83
HO-P-182-207-96	South Branch Patapsco River	Patapsco South Branch	3.83
HO-N-019-304-96	Deep Run	Patapsco River Lower North	3.76
<i>Worst (most degraded sites first)</i>			
MPAX-104-R-2002	Middle Patuxent River UT6	Patuxent River Middle	1.33
PATL-111-R-2000	Deep Run UT2	Patapsco River Lower North	1.67
HO-P-195-130-97	Plumtree Branch UT	Little Patuxent River	1.67
HO-N-038-204-97	Dorsey Branch to Little Patuxent River	Little Patuxent River	1.83
HO-P-098-224-97	Little Patuxent River UT	Little Patuxent River	2.00
HO-P-208-120-97	Plumtree Branch UT	Little Patuxent River	2.00
HO-N-022-104-97	Patuxent River UT	Patuxent River Upper	2.00
HO-P-143-109-97	Tridelpia Reservoir UT	Brighton Dam	2.17
HO-N-018-213-95	Deep Run	Patapsco River Lower North	2.17
HO-P-018-106-97	Tridelpia Reservoir UT	Brighton Dam	2.33
LPAX-116-R-2000	Little Patuxent River UT1	Little Patuxent River	2.33
PATL-106-R-2000	Deep Run UT1	Patapsco River Lower North	2.33
HO-P-002-321-97	Little Patuxent River	Little Patuxent River	2.50
PATL-207-R-2000	Tiber Run	Patapsco River Lower North	2.50
RKGR-403-R-2002	Patuxent River	Rocky Gorge Dam	2.50
RKGR-404-R-2002	Patuxent River	Rocky Gorge Dam	2.50
LPAX-311-R-2000	Little Patuxent River	Little Patuxent River	2.67
PATL-103-R-2000	Deep Run UT2	Patapsco River Lower North	2.67
HO-P-068-231-96	Rockburn Branch	Patapsco River Lower North	2.67
HO-P-169-111-97	Cattail Creek UT	Brighton Dam	2.67
LPAX-204-R-2000	Little Patuxent River	Little Patuxent River	2.67
HO-P-036-314-95	Patapsco River	Patapsco South Branch	2.83
LPAX-113-R-2000	Hammond Branch	Little Patuxent River	2.83
PATL-317-R-2000	Deep Run	Patapsco River Lower North	2.83

Table 8-32. Stream Waders sites sampled in Howard County during 2000-2004, ranked by Family-level Benthic Index of Biotic Integrity

Howard County - Stream Wader Sites					
WATERSHED	# GOOD	# FAIR	# POOR	# VERY POOR	
Brighton Dam	7	3	1	1	
Little Patuxent River	1	9	6	22	
Patuxent River Middle	0	8	3	5	
Patapsco River LN Branch	0	3	1	8	
Patapsco South Branch	0	8	0	0	

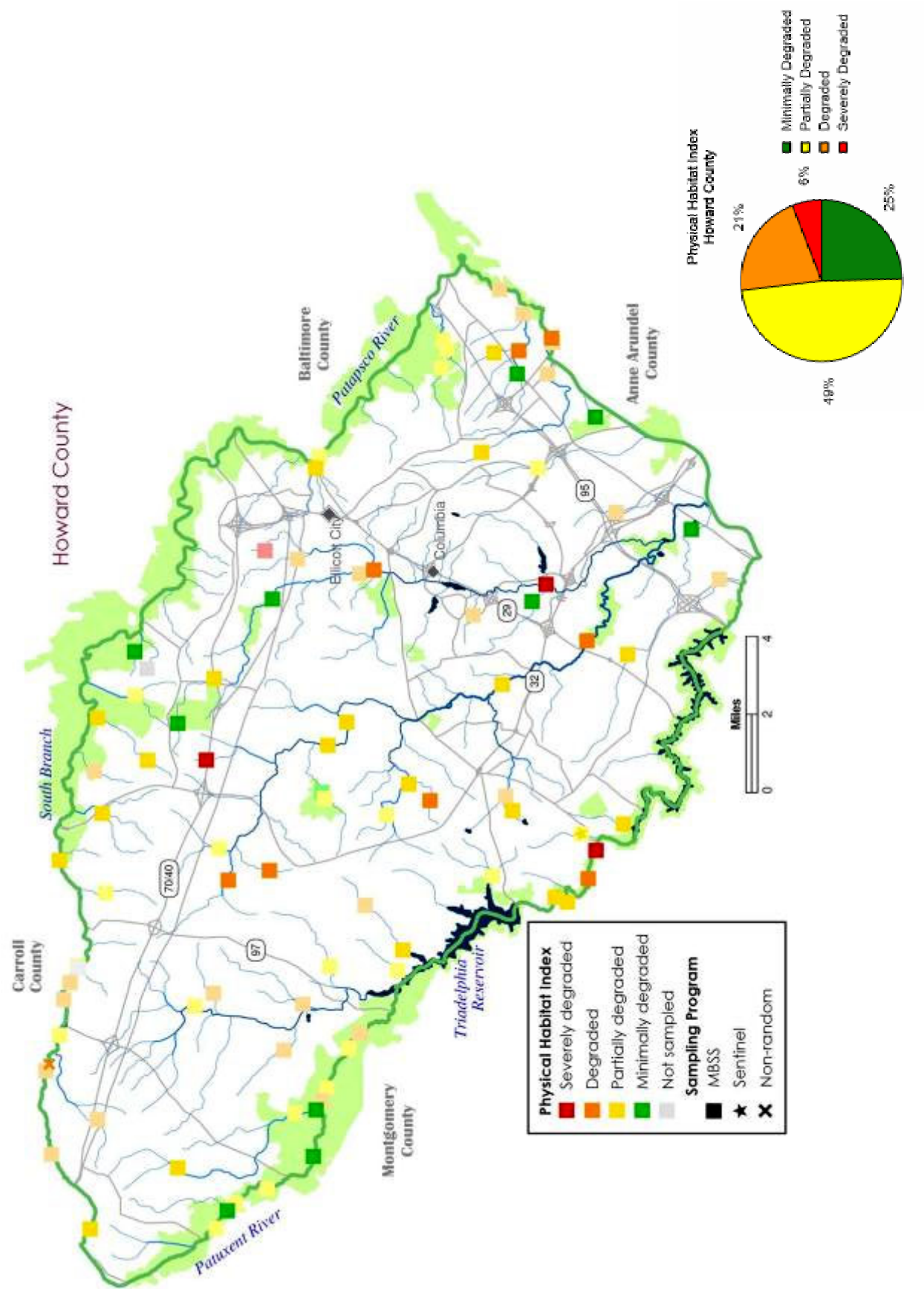


Figure 8-124. Physical Habitat Index (PHI) pie chart and map of stream habitat quality for Howard County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

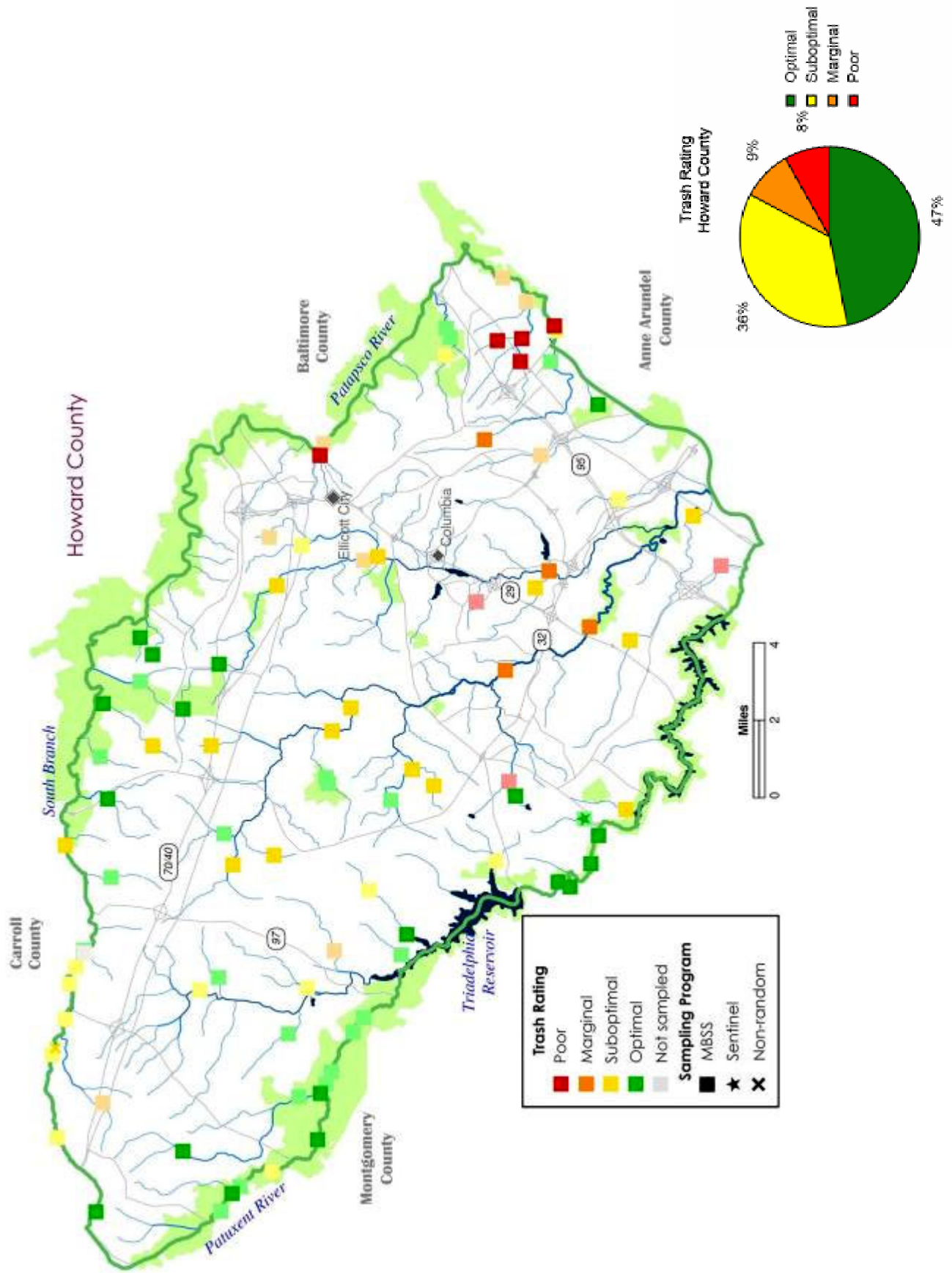


Figure 8-125. Pie chart and map of trash rating (0-20 scale) for Howard County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only)

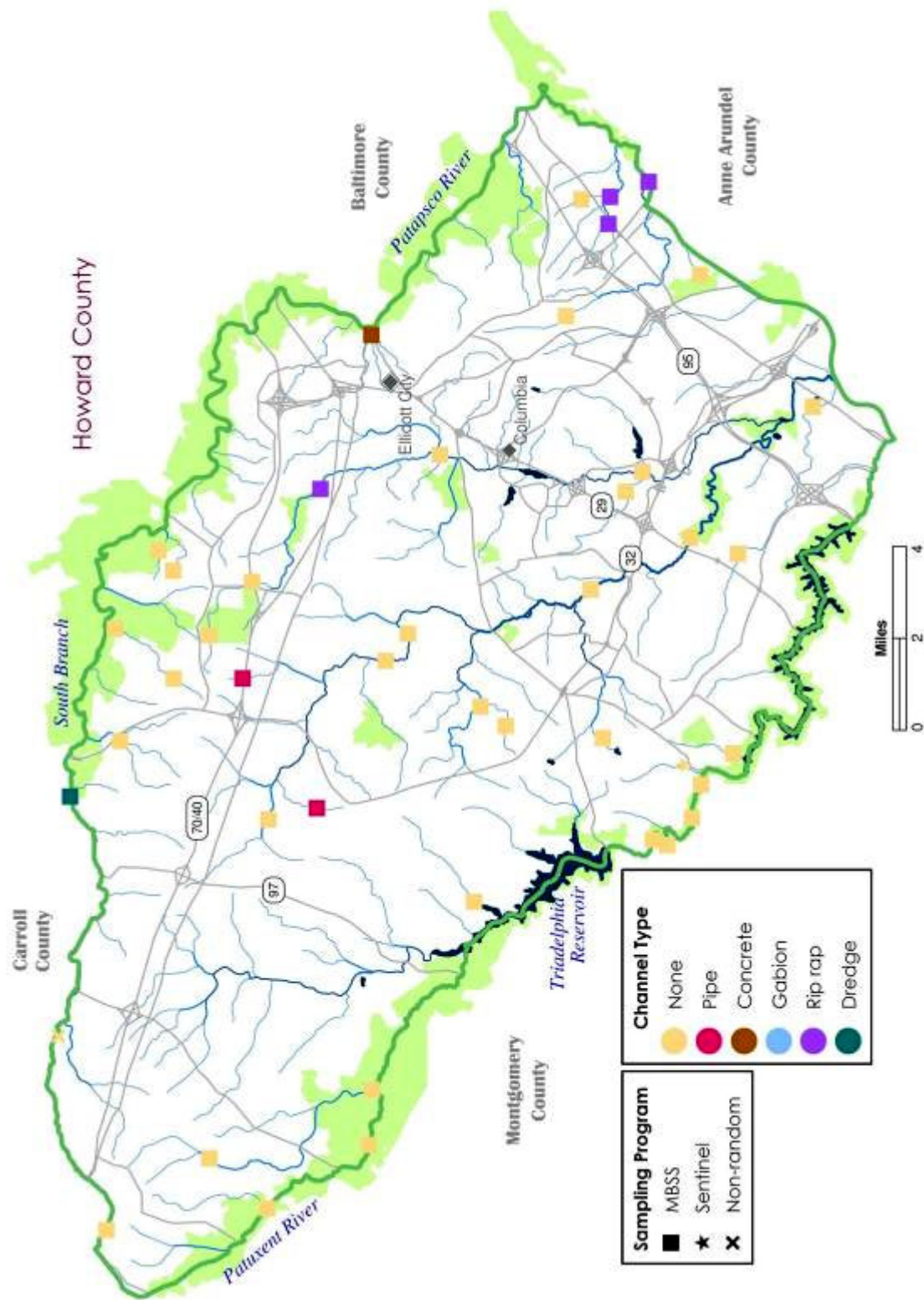


Figure 8-126. Map of channelized sites, by type, for Howard County streams sampled by the MBSS during 2000-2004. *NOTE: When channelization is indicated, it does not necessarily mean that the entire 75m segment was affected.*

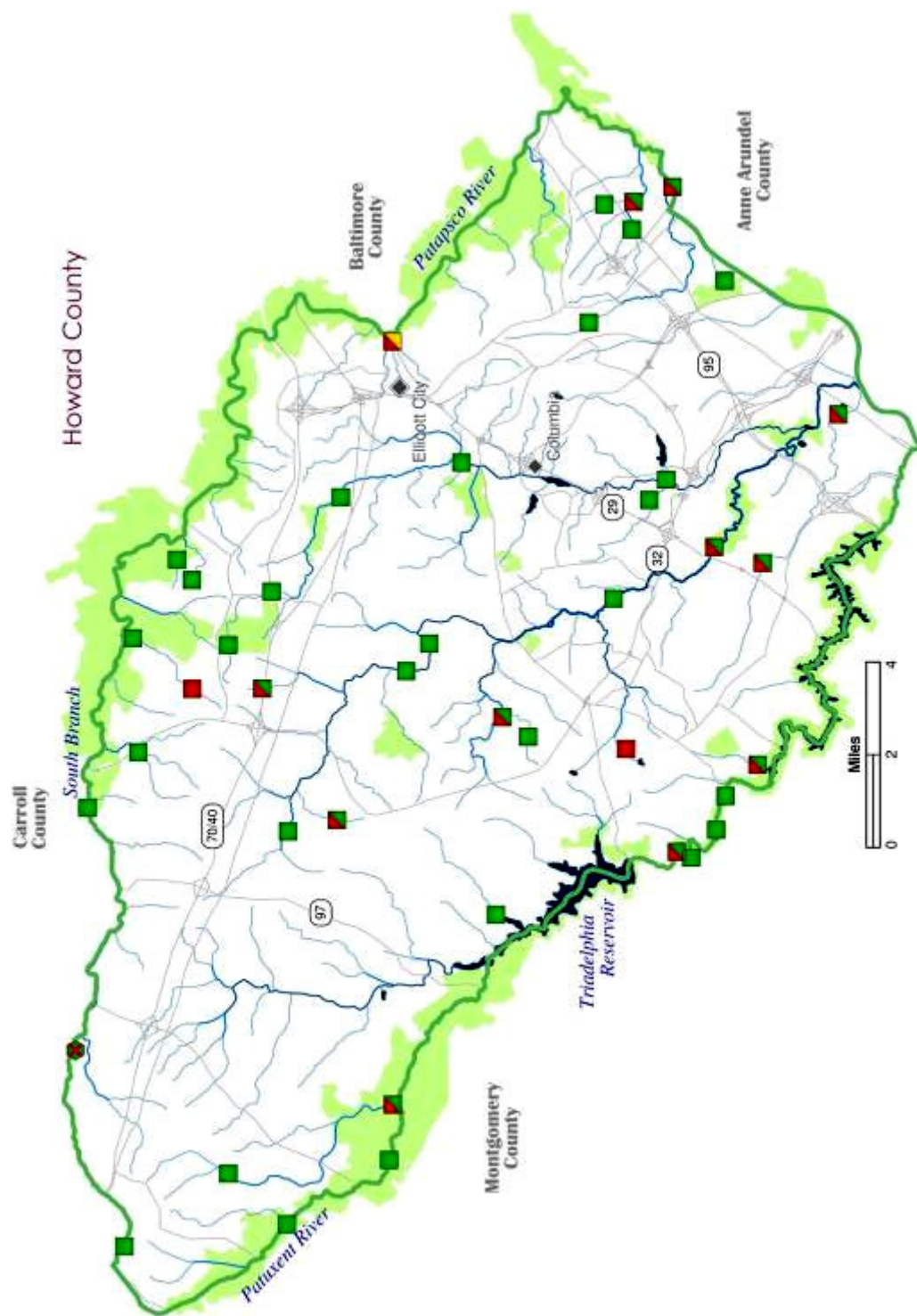
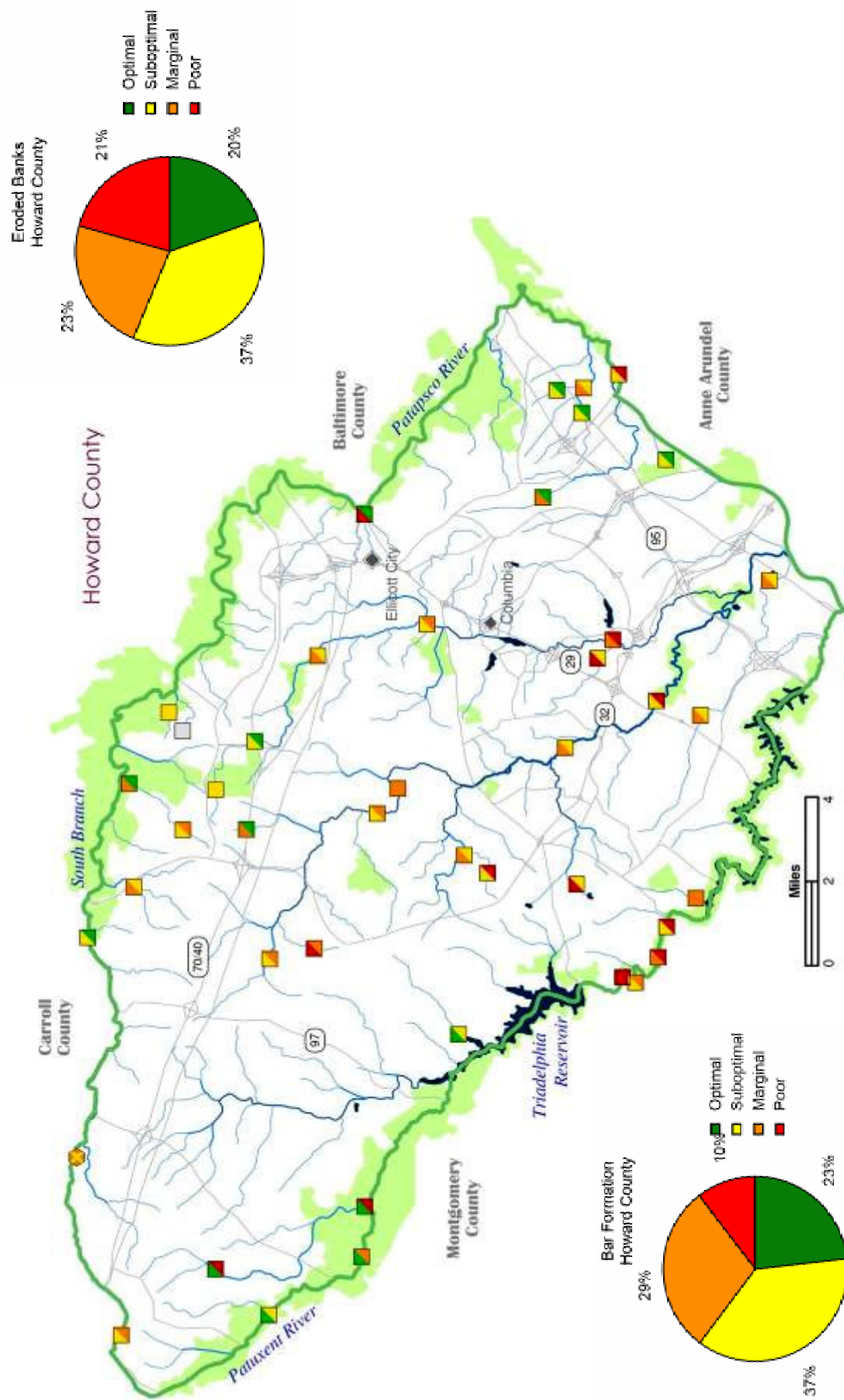


Figure 8-127. Map of sites with inadequate riparian buffers and buffer breaks for Howard County streams sampled by the MBSS during 2000-2004. *NOTE: Multiple riparian buffer breaks sometimes occurred at a site; only the most severe was depicted.*

Figure 8-128. Pie charts and map of sites with eroded banks and instream bar formation for Howard County streams sampled by the MBSS during 2000-2004



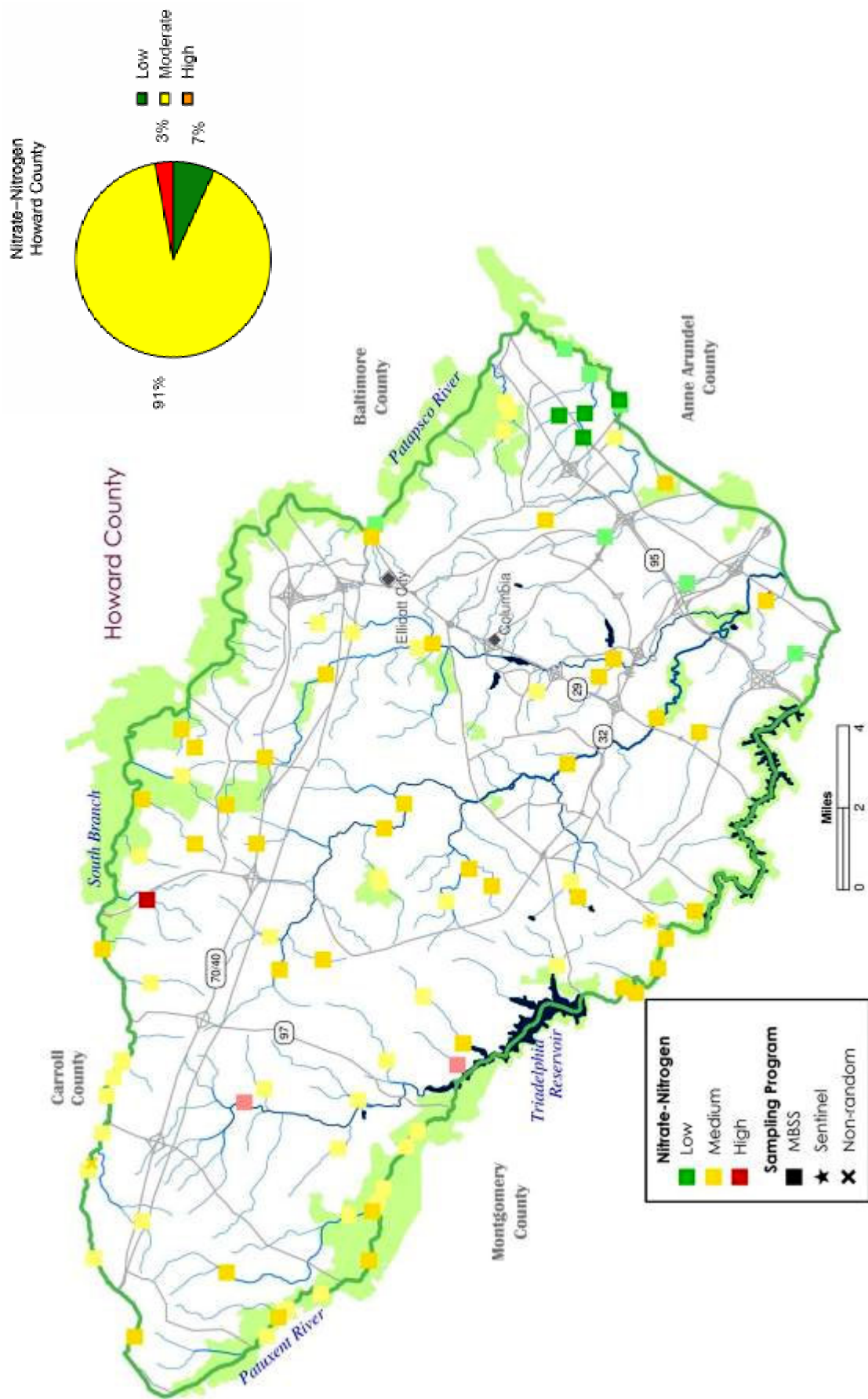


Figure 8-129. Pie chart and map of nitrate-nitrogen values (mg/l) for Howard County streams sampled by the MBSS during 1995-97 and 2000-2004 (pie chart represents 2000-2004 data only) (Low = 1.0, Medium = 1.0 – 5.0, High = > 5.0)

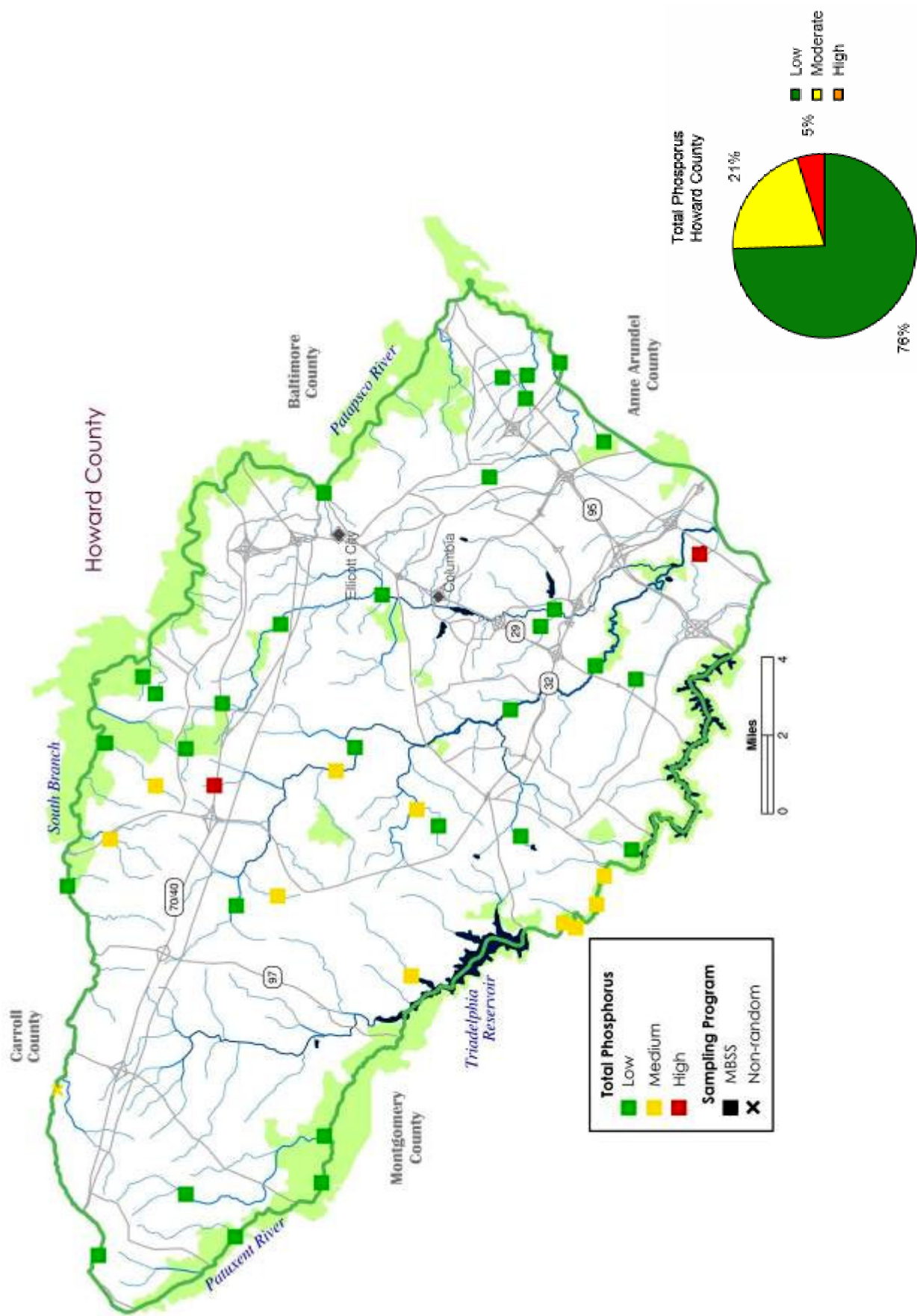


Figure 8-130. Pie chart and map of total phosphorus values (mg/l) for Howard County streams sampled by the MBSS during 2000-2004 (Low = < 0.025, Medium = 0.025 – 0.07, High = > 0.07)

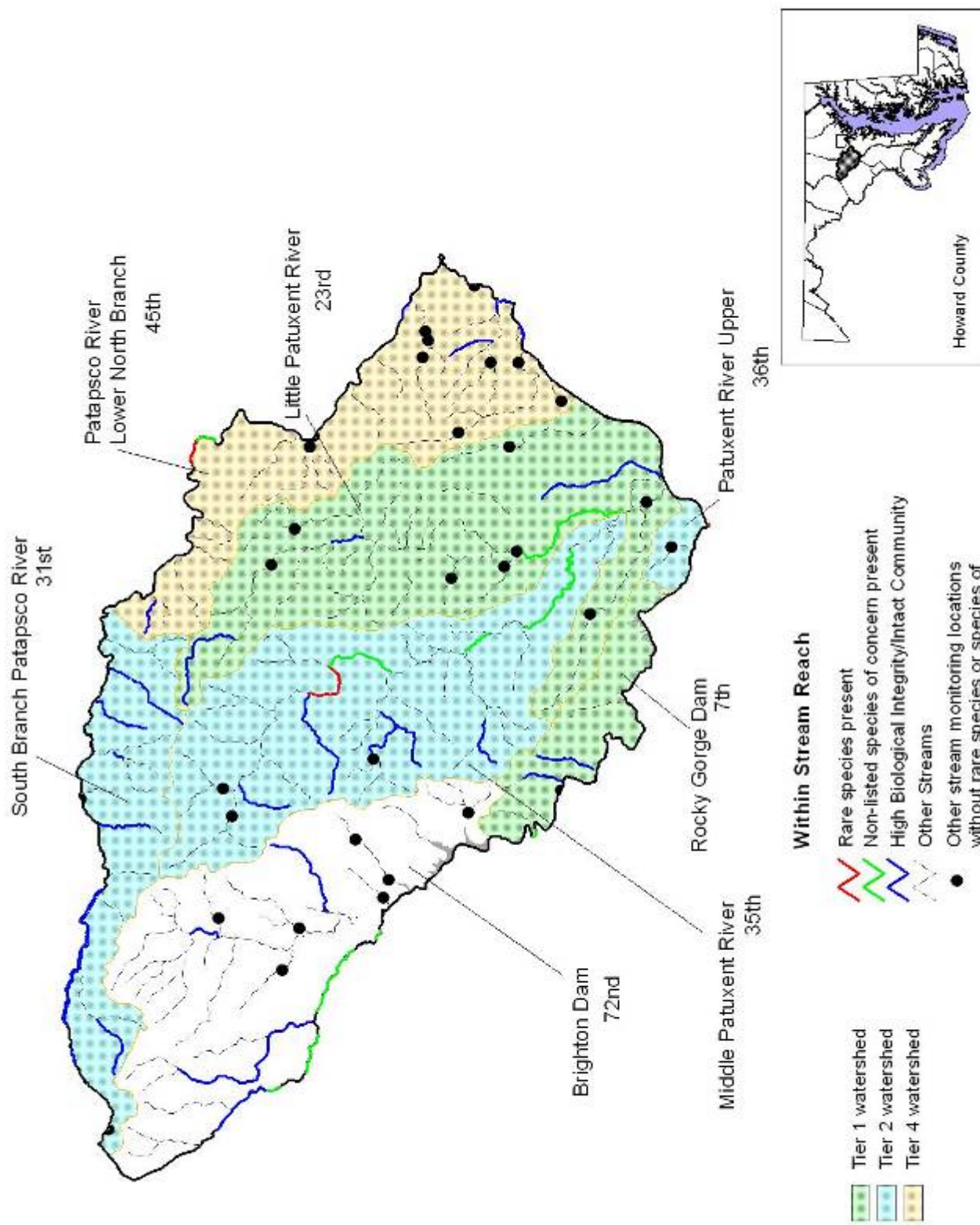


Figure 8-131. Aquatic Heritage Biodiversity Ranking map for Howard County, by watershed. Data from MBSS 1994-2004, MBSS qualitative data, Raesly, unpub. data, Harris 1975, Thompson 1984, and DNR Natural Heritage Program database.

